

STATE OF MISSOURI



DEPARTMENT OF NATURAL RESOURCES

MISSOURI AIR CONSERVATION COMMISSION

PERMIT TO CONSTRUCT

Under the authority of RSMo 643 and the Federal Clean Air Act the applicant is authorized to construct the air contaminant source(s) described below, in accordance with the laws, rules and conditions as set forth herein.

Permit Number: 11 2015 - 003

Project Number: 2015-07-059
Installation Number: 183-0261

Parent Company: Zoltek Corporation

Parent Company Address: 3101 McKelvey Road, Bridgeton, MO 63044

Installation Name: Zoltek

Installation Address: 27 Guenther Boulevard, St. Peters, MO 63376

Location Information: St. Charles County (Landgrant 00731, T47N, R3E)

Application for Authority to Construct was made for:

The installation of eighteen (18) new pultrusion lines and associated support equipment. This review was conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*.

Standard Conditions (on reverse) are applicable to this permit.

Standard Conditions (on reverse) and Special Conditions are applicable to this permit.

Prepared by
Ryan Schott
New Source Review Unit

Director or Designee
Department of Natural Resources

NOV 02 2015

Effective Date

STANDARD CONDITIONS:

Permission to construct may be revoked if you fail to begin construction or modification within two years from the effective date of this permit. Permittee should notify the Air Pollution Control Program if construction or modification is not started within two years after the effective date of this permit, or if construction or modification is suspended for one year or more.

You will be in violation of 10 CSR 10-6.060 if you fail to adhere to the specifications and conditions listed in your application, this permit and the project review. In the event that there is a discrepancy between the permit application and this permit, the conditions of this permit shall take precedence. Specifically, all air contaminant control devices shall be operated and maintained as specified in the application, associated plans and specifications.

You must notify the Department's Air Pollution Control Program of the anticipated date of startup of these air contaminant sources. The information must be made available within 30 days of actual startup. Also, you must notify the Department of Natural Resources' regional office responsible for the area within which you are located within 15 days after the actual startup of these air contaminant sources.

A copy of this permit and permit review shall be kept at the installation address and shall be made available to Department of Natural Resources' personnel upon request.

You may appeal this permit or any of the listed special conditions to the Administrative Hearing Commission (AHC), P.O. Box 1557, Jefferson City, MO 65102, as provided in RSMo 643.075.6 and 621.250.3. If you choose to appeal, you must file a petition with the AHC within 30 days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed. If it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by the AHC.

If you choose not to appeal, this certificate, the project review and your application and associated correspondence constitutes your permit to construct. The permit allows you to construct and operate your air contaminant sources(s), but in no way relieves you of your obligation to comply with all applicable provisions of the Missouri Air Conservation Law, regulations of the Missouri Department of Natural Resources and other applicable federal, state and local laws and ordinances.

The Air Pollution Control Program invites your questions regarding this air pollution permit. Please contact the Construction Permit Unit at (573) 751-4817. If you prefer to write, please address your correspondence to the Missouri Department of Natural Resources, Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102-0176, attention: Construction Permit Unit.

SPECIAL CONDITIONS:

The permittee is authorized to construct and operate subject to the following special conditions:

The special conditions listed in this permit were included based on the authority granted the Missouri Air Pollution Control Program by the Missouri Air Conservation Law (specifically 643.075) and by the Missouri Rules listed in Title 10, Division 10 of the Code of State Regulations (specifically 10 CSR 10-6.060). For specific details regarding conditions, see 10 CSR 10-6.060 paragraph (12)(A)10. "Conditions required by permitting authority."

Zoltek

St. Charles County (Landgrant 00731, T47N, R3E)

1. Control Device Requirement – Thermal Oxidizer
 - A. Zoltek shall control emissions from the eighteen (18) new pultrusion lines (EP-1 – EP-18) and resin mixing/ handling (EP-19) using a thermal oxidizer, as specified in the permit application.
 - B. The thermal oxidizer shall be operated and maintained in accordance with the manufacturer's specifications. The thermal oxidizer shall be in use at all times when EP-1 – EP-18 and/or EP-19 are in operation.
 - C. Zoltek shall continuously monitor and record the combustion zone temperature while the plant is operating. This includes all periods of startup, shutdown, and malfunction. The operating temperature of the thermal oxidizer shall be maintained at a minimum of 1,500° Fahrenheit.
 - D. Zoltek shall maintain a copy of the thermal oxidizer manufacturer's performance warranty on site.
 - E. Zoltek shall maintain an operation and maintenance log for the thermal oxidizer, which shall include the following:
 - 1) Incidents of malfunction, with impact on emissions, duration of event, probable cause, and corrective actions; and
 - 2) Maintenance activities, with inspection schedule, repair actions, and replacements, etc.
2. Record Keeping and Reporting Requirements
 - A. Zoltek shall maintain all records required by this permit for not less than five years and shall make them available immediately to any Missouri Department of Natural Resources' personnel upon request. These records shall include SDS for all materials used.
 - B. Zoltek shall report to the Air Pollution Control Program's Compliance/Enforcement Section, P.O. Box 176, Jefferson City, MO 65102, no later than 10 days after the end of the month during which any record required by this permit shows an exceedance of a limitation imposed by this permit.

REVIEW OF APPLICATION FOR AUTHORITY TO CONSTRUCT AND OPERATE
SECTION (5) REVIEW

Project Number: 2015-07-059

Installation ID Number: 183-0261

Permit Number:

Installation Address:

Zoltek
27 Guenther Boulevard
St. Peters, MO 63376
St. Charles County (Landgrant 00731, T47N, R3E)

Parent Company:

Zoltek Corporation
3101 McKelvey Road
Bridgeton, MO 63044

REVIEW SUMMARY

- Zoltek has applied for authority to install eighteen (18) new pultrusion lines and associated support equipment.
- The application was deemed complete on August 5, 2015.
- HAP emissions are expected from the proposed equipment. HAPs of concern from this process include styrene and methyl isobutyl ketone (MIBK).
- 40 CFR 60 Subpart VVV, *Standards of Performance for Polymeric Coating of Supporting Substrates Facilities*, applies to the equipment.
- None of the NESHAPs apply to this installation. None of the currently promulgated MACT regulations apply to the proposed equipment.
- This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of VOCs and HAPs are conditioned below de minimis levels.
- This installation is located in St. Charles County, a nonattainment area for the 8-hour ozone standard and the PM_{2.5} standard and an attainment area for all other criteria pollutants.
- This installation is not on the List of Named Installations found in 10 CSR 10-6.020(3)(B), Table 2. The installation's major source level is 100 tons per year for PM_{2.5}, NO_x, and VOCs; 250 tons per year for all other pollutants; and fugitive emissions are not counted toward major source applicability.
- Ambient air quality modeling was performed to determine the ambient impact of styrene.
- Emission testing is not required for the equipment.
- Submittal of a Basic Operating Permit application is required within 30 days of equipment startup.

- Approval of this permit is recommended with special conditions.

INSTALLATION/ PROJECT DESCRIPTION

Zoltek is proposing to construct a new carbon fiber manufacturing facility in St. Peters, Missouri. Zoltek plans to install eighteen new carbon fiber pultrusion lines, along with several resin material storage and handling operations. The new pultrusion lines will be used to create carbon fiber blades for wind turbines. The pultrusion process involves the reinforcement of carbon fibers that are impregnated with resin, then pulled through a heated stationary die where it undergoes polymerization. Ancillary equipment to the process will include resin mixers, storage drums, and carbon fiber composite cutting. Each pultrusion line (including cutting) has a maximum production rate of 9.73 board feet per hour, and the resin handling/ mixing process has a maximum design rate of 85.34 gallons per hour.

EMISSIONS/CONTROLS EVALUATION

Emissions from the eighteen pultrusion lines were calculated using material balances for the VOC and HAP containing compounds. Volatile and HAP percentages for each chemical were taken from the respective SDS and multiplied by the maximum design rate of the production lines to find the maximum VOC and HAP usage rates. Volumetric design rates for resin application were measured using a standard length of 1 meter, width of 105 millimeters (mm), and depth of 3 mm, which were then converted to board feet per meter of product. It was assumed that the process has a 93% yield for resin application, which is conservative for the industry, so the remaining 7% VOCs and HAPs are emitted.

Emissions from resin mixing and handling were calculated using the loading loss equation from the EPA document AP-42, *Compilation of Air Pollutant Emission Factors*, Fifth Edition, Section 5.2, *Transportation and Marketing of Petroleum Liquids* (July 2008). It was conservatively assumed that 100% styrene is processed, as a worst-case scenario. A saturation factor of 1.45 was used, which was taken from Table 5.2-1. The vapor pressure and molecular weight of styrene were taken from the SDS, and the temperature was assumed to be 68°F. The calculated emission rate was found to be 0.345 pounds of styrene per 1,000 gallons of material loaded.

Particulate emissions from carbon fiber board cutting were estimated by calculating the cut volume for each cut made. The maximum board pull rate (meters per minute) was used to determine the maximum cutting rate, which was found to be 6.71 cuts per day. The volume of each cut was conservatively estimated to be 1/8 inch wide, on a 300 mm long, 3 mm deep board; this results in a cut volume of 1.01E^{-4} cubic feet per cut. Using these values, along with the density of the carbon fiber board, the mass of board lost due to cutting was estimated. It was assumed that 100% of the lost board is emitted as particulate matter and that all particulate is PM_{2.5}.

A thermal oxidizer will be used to control VOC and HAP emissions from the pultrusion lines and resin mixing/ handling. The thermal oxidizer has an overall control efficiency of 95% for both VOCs and volatile HAPs.

The following table provides an emissions summary for this project. Because this is a new facility, there are no existing potential or actual emissions. Potential emissions of the application represent the potential of the new equipment, assuming continuous operation (8,760 hours per year) at the maximum design rate. Conditioned potential emissions represent the subsequent potentials of all equipment after accounting for the use of the thermal oxidizer.

Table 1: Emissions Summary (tons per year)

Pollutant	Regulatory <i>De Minimis</i> Levels / SMAL	Existing Potential Emissions	Existing Actual Emissions	Potential Emissions of the Application	New Installation Conditioned Potential
PM	25.0	N/A	N/A	0.01	0.41
PM ₁₀	15.0	N/A	N/A	0.01	0.41
PM _{2.5}	10.0	N/A	N/A	0.01	0.41
SO _x	40.0	N/A	N/A	N/A	0.03
NO _x	40.0	N/A	N/A	N/A	5.37
VOC	40.0	N/A	N/A	79.84	8.06
CO	100.0	N/A	N/A	N/A	4.51
Styrene	10.0 / 1	N/A	N/A	77.80	7.57
MIBK	10.0 / 10	N/A	N/A	0.27	0.03
Total HAPs	25.0	N/A	N/A	78.07	7.60

N/A = Not Applicable

Note: The majority of PM, PM₁₀, and PM_{2.5} emissions, as well as all SO_x, NO_x, and CO emissions, are a result of the natural gas fired thermal oxidizer's operation.

PERMIT RULE APPLICABILITY

This review was conducted in accordance with Section (5) of Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*. Potential emissions of VOCs and HAPs are conditioned below de minimis levels.

APPLICABLE REQUIREMENTS

Zoltek shall comply with the following applicable requirements. The Missouri Air Conservation Laws and Regulations should be consulted for specific record keeping, monitoring, and reporting requirements. Compliance with these emission standards, based on information submitted in the application, has been verified at the time this application was approved. For a complete list of applicable requirements for your installation, please consult your operating permit.

GENERAL REQUIREMENTS

- *Submission of Emission Data, Emission Fees and Process Information*, 10 CSR 10-6.110
- *Operating Permits*, 10 CSR 10-6.065
- *Restriction of Particulate Matter to the Ambient Air Beyond the Premises of Origin*, 10 CSR 10-6.170
- *Restriction of Emission of Visible Air Contaminants*, 10 CSR 10-6.220
- *Restriction of Emission of Odors*, 10 CSR 10-6.165

SPECIFIC REQUIREMENTS

- *New Source Performance Regulations*, 10 CSR 10-6.070
 - *Standards of Performance for Polymeric Coating of Supporting Substrates Facilities*, 40 CFR Part 60, Subpart VVV

AMBIENT AIR QUALITY IMPACT ANALYSIS

Ambient air quality modeling was performed to determine the ambient impact of styrene. Conditioned potential styrene emissions are 7.57 tons per year, which exceed the SMAL of 1 ton per year, thus requiring modeling. Modeling was performed using EPA's AERSCREEN. The maximum modeled impact for styrene was found to be less than the risk assessment levels (RALs) for both the 24-hour and annual averaging times. This means that although the SMAL for styrene is exceeded, at the conditioned potential of 7.57 tons per year emitted, the facility is always expected to be in compliance with the RALs. No further analysis is necessary.

Table 2. Ambient Air Quality Impact Analysis Summary

Pollutant	RAL ($\mu\text{g}/\text{m}^3$)	Averaging Time	Modeled Impact ($\mu\text{g}/\text{m}^3$)	Limited Impact ($\mu\text{g}/\text{m}^3$)
Styrene	2,240	24-hour	613.2	N/A
	333	Annual	102.2	N/A

STAFF RECOMMENDATION

On the basis of this review conducted in accordance with Section (5), Missouri State Rule 10 CSR 10-6.060, *Construction Permits Required*, it is recommended that this permit be granted with special conditions.

PERMIT DOCUMENTS

The following documents are incorporated by reference into this permit:

- The Application for Authority to Construct form, dated July 20, 2015, received July 24, 2015, designating Zoltek Corporation as the owner and operator of the installation.

APPENDIX A

Abbreviations and Acronyms

%	percent	m/s	meters per second
°F	degrees Fahrenheit	Mgal	1,000 gallons
acfm	actual cubic feet per minute	MW	megawatt
BACT	Best Available Control Technology	MHDR	maximum hourly design rate
BMPs	Best Management Practices	MMBtu	Million British thermal units
Btu	British thermal unit	MMCF	million cubic feet
CAM	Compliance Assurance Monitoring	MSDS	Material Safety Data Sheet
CAS	Chemical Abstracts Service	NAAQS ...	National Ambient Air Quality Standards
CEMS	Continuous Emission Monitor System	NESHAPs	National Emissions Standards for Hazardous Air Pollutants
CFR	Code of Federal Regulations	NO_x	nitrogen oxides
CO	carbon monoxide	NSPS	New Source Performance Standards
CO₂	carbon dioxide	NSR	New Source Review
CO_{2e}	carbon dioxide equivalent	PM	particulate matter
COMS	Continuous Opacity Monitoring System	PM_{2.5}	particulate matter less than 2.5 microns in aerodynamic diameter
CSR	Code of State Regulations	PM₁₀	particulate matter less than 10 microns in aerodynamic diameter
dscf	dry standard cubic feet	ppm	parts per million
EQ	Emission Inventory Questionnaire	PSD	Prevention of Significant Deterioration
EP	Emission Point	PTE	potential to emit
EPA	Environmental Protection Agency	RACT	Reasonable Available Control Technology
EU	Emission Unit	RAL	Risk Assessment Level
fps	feet per second	SCC	Source Classification Code
ft	feet	scfm	standard cubic feet per minute
GACT	Generally Available Control Technology	SDS	Safety Data Sheet
GHG	Greenhouse Gas	SIC	Standard Industrial Classification
gpm	gallons per minute	SIP	State Implementation Plan
gr	grains	SMAL	Screening Model Action Levels
GWP	Global Warming Potential	SO_x	sulfur oxides
HAP	Hazardous Air Pollutant	SO₂	sulfur dioxide
hr	hour	tph	tons per hour
hp	horsepower	tpy	tons per year
lb	pound	VMT	vehicle miles traveled
lbs/hr	pounds per hour	VOC	Volatile Organic Compound
MACT	Maximum Achievable Control Technology		
µg/m³	micrograms per cubic meter		

Mr. Brian Butler
Corporate EHS Manager
Zoltek
3101 McKelvey Road
Bridgeton, MO 63044

RE: New Source Review Permit - Project Number: 2015-07-059

Dear Mr. Butler:

Enclosed with this letter is your permit to construct. Please study it carefully and refer to Appendix A for a list of common abbreviations and acronyms used in the permit. Also, note the special conditions on the accompanying pages. The document entitled, "Review of Application for Authority to Construct," is part of the permit and should be kept with this permit in your files. Operation in accordance with these conditions, your new source review permit application and with your amended operating permit is necessary for continued compliance. The reverse side of your permit certificate has important information concerning standard permit conditions and your rights and obligations under the laws and regulations of the State of Missouri.

If you were adversely affected by this permit decision, you may be entitled to pursue an appeal before the administrative hearing commission pursuant to Sections 621.250 and 643.075.6 RSMo. To appeal, you must file a petition with the administrative hearing commission within thirty days after the date this decision was mailed or the date it was delivered, whichever date was earlier. If any such petition is sent by registered mail or certified mail, it will be deemed filed on the date it is mailed; if it is sent by any method other than registered mail or certified mail, it will be deemed filed on the date it is received by: Administrative Hearing Commission, Truman State Office Building, P.O. Box 1557, Jefferson City, MO 65102, www.oa.mo.gov/ahc.

If you have any questions regarding this permit, contact Ryan Schott, at the Department of Natural Resources' Air Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102 or at (573) 751-4817.

Sincerely,

AIR POLLUTION CONTROL PROGRAM

Susan Heckenkamp
New Source Review Unit Chief

SH:rs1

Enclosures

c: St. Louis Regional Office
PAMS File: 2015-07-059

Permit Number: